SOCIETY. INTEGRATION. EDUCATION
Proceedings of the International Scientific Conference. Volume II, May 24th -25th, 2019. 555-564

ABILITY OF CHILDREN TO DRAW AND SPATIALLY MODEL "A TREE"

Ewa Piwowarska
Uniwersytet Humanistyczno-Przyrodniczy im. Jana Długosza w Częstochowie, Poland

Abstract. *Many well-known educationalists and psychologists noticed that children included "a tree" in their drawings very early, which usually occurred next to a figure or a building. The drawing of the tree, which was treated as a substitute of graphical picture of a figure, constituted material for the research they conducted. Artistic activity is also one of the determinants of diagnosing child's development and one of many opportunities to say about particular topics, which are preferred by the child. Another precious activity is -next to the drawing-spatial modelling of soft material. The research conducted with the use of the technique of analysis of the artistic works aimed at defining the course of development of "a tree" drawn and spatially modelled by children at preschool age. It was important for the conducted studies to distinguish models of "a tree" – created in two art techniques – typical of particular age along with their characteristic features (clarity of the message, colouring, details used). The subject of the study concerned artworks on flat surface and three dimensional models of a tree formed by children aged 3 to 6 years. Distinguished characteristic features of the drawn and spatially modelled "tree" may become helpful for teachers in assessing development of children.*
Keywords: *children, artistic activity, analysis, drawing, modeling, a tree.*

Introduction

Many researchers have been interested in children's art works – in particular drawings – since the end of the 19th century. The research described below is a continuation of analyses of this particular activity of children made by researchers for many years. The aim of this research is to indicate characteristic stages related to changes in graphical records and spatial modelling taking place with age. It focuses on determining the course of development of pre-school children's skills at drawing and spatial modelling of "a tree". The important point is to indicate some models that are typical of particular age (most frequently occurring) and to define correlations between drawn and modelled forms. Determining characteristic features of the art works crated by children may support teachers in diagnosing children's development.

http://dx.doi.org/10.17770/sie2019vol2.3785

Children's artistic presentations of trees: Theoretical Background for Empirical Research

The beginnings of interest in a child's drawings date back to the second half of the 19th century when some research based on descriptions of artistic works was carried out by: Ebencer Cooke (1885) and Corrado Ricci (1887). Analysis of drawings of big population of children was conducted in further years among others by: Georg Kerschensteiner, Viktor Lowenfeld and, in Poland, by Stefan Szuman (Hornowski, 1982, 9-10), Bolesław Hornowski, Stanisław Popek and others. They determined and described – so important for children education – developmental stages of drawings. They distinguished scribbling stage (chaotic and controlled scribbling), which was characterized by lack of abilities to present readable content in the picture because they were recorded by more or less dynamic lines (Fleck-Bangert, 2002, 25-28; Szuścik, 2006, 118-124). Next stage of development of the works were characterized by building some understandable pictures with the use of simple geometric forms (figures having head and legs or head and body, stage of simplified schema). Along with development of children's knowledge, the expanded drawings they made contained more and more details (stage of enriched schema), so that with time they could (younger school age) achieve a stage that was close to realism.

Besides crayons and pencils, a material preferred by children, which resists when being modelled and requires direct contact, is plastic soft material (e.g. clay, plasticine, salt mass). Analysis of the process of modelling forms from clay by children at preschool age was carried out by: V. Lowenfeld and W. Lambert Brittain (1949), Maria Parnowska–Kwiatowska (1960). The abovementioned first two researched indicated characteristic two ways of modelling solid figures by children: one is based on extracting characteristic parts of the planned sculpture from a clod of clay, while the second way of working is based on combining smaller pieces into a larger whole (Lovenfeld & Brittain, 1960, 59-69, 86-113). On the other hand, M. Parnowska–Kwiatowska, who analysed works in clay made by 3-4-year-old children, noticed that they often modelled solid figures in more notional way – naming them – rather than revealing through its appearance the form resembling particular object. The author pointed out three ways of forming clay by children: making the most primitive "manipulative" forms (pressing the ends of the fingers in a plastic material), creating mature geometrical shapes (discs, rollers, balls) and modelling bent forms (Parnowska-Kwiatowska, 1960, 4, 119-121, 141-143, 147, 153).

Knowledge concerning further stages typical of children and related to drawing and modelling of soft material is a kind of the rudiments for a teachers, who, thanks to it, can notice and define progress within the scope of children's

creation and understand pictures presented by children that use various types of – illegible for an average recipient – ways of seeing (intentional perspective, X-ray perspective, topographical perspective, vertical perspective and overlapping perspective) or modelling sculptures.

It should be mentioned that psychologists were using drawings as a projection method to analyse particular problem. Such a material to carry out examination was also a drawing of "a tree", which was treated as a substitute of a drawing of a figure. Surely this topic was less limited by stereotypes and conventionality, which was the advantage. Many scientists, such as: H. Hetzer, J. Jacobi, J. Kretschmer (Rembowski, 1975, 302), noticed that children fitted a tree in their drawings very early, and it usually appeared next to a human figure and a house.

E. Jucker in his professional practice tried to use drawings of a tree as a tool of psycho-diagnostic examinations. Observations and experiments conducted for many years (since 1928), long studies in history of culture allowed him to present his technique publicly no sooner than in 1948. It consisted in drawing a fruit tree, which was regarded to be a synthesis of remembered observations. He based his research activity on a thesis that people's behaviour, their memory and observations, as well as their development, could be compared to creation of forks at the main line of life, similarly as in the development of a tree.

This research technique, according to K. Koch (1949), who was inspired by E. Jucker's research and appreciated his inspiration in this interpretation, allowed to present the state of the development of personality (internal differentiation and intelligence) with the use of drawings as well as impact of the environment and individual's attitude towards closest surroundings. He claimed that patient's "internal content" was revealed – usually unconsciously - through the drawing of a tree.

Renée Stora (Stora, 1949, 327-344) tried to improve the research by Ch.Koch, in particular his method of interpretation. In her work she defined psychological meaning (126 basic meanings) – however it is difficult to determine on what basis – and tried to present personality with the use of 4 drawings: a tree strange to the patient, a close tree, a tree that symbolized desires and a tree that revealed burden of some experiences. This research, however, does not seem to be very precise (Wallon, Cambier, & Engelhart, 1993, 109).

Another works concerning drawings of a tree were conducted by: F. Muschoot and W. Demeyer (1974). People examined by them (5-18 years) were to draw a tree, having total freedom in selecting its type and colours. They distinguished some features that were important for the diagnosis, which they precisely illustrated and defined. It is also worth referring to the research by John Buck (Buck, 1948, 317) who was a creator of House-Tree-Person test (H-T-P).

He was a follower of F. Goodenough, whose work and its results were based on serious clinical research conducted (Wallon, Cambier, & Engelhart, 1993, 110).

Methodology of Research

Many well-known educationalists and psychologists noticed that children included "a tree" in their drawings very early, which usually occurred next to a figure or a building. Artistic activity is also one of the determinants of diagnosing child's development and one of many opportunities to say about particular topics, which are preferred by the child. Another precious activity is -next to the drawing- spatial modelling of soft material. The research conducted with the use of the technique of analysis of the artistic works aimed at defining the course of development of "a tree" drawn and spatially modelled by children at preschool age. The review of art works comprised, apart from abovementioned topic, also human figures and houses. Due to limitations concerning size of this article, presented characterization is focused only on one issue. It was important for the conducted studies to distinguish models of "a tree" – created in two art techniques – typical of particular age along with their characteristic features (clarity of the message, colouring, details used). The research was conducted in Polish preschools located in Silesian voivodship (northern part). I would like to mention that the study referring to spatial modelling with the use of modelling clay comprised 397 children. The analysis below referred only to spatial solutions, which meant 332 artistic models because other works were mostly flat or semi-spatial works. Among 376 children, the twelve youngest did not draw anything at all, therefore only 364 drawings were analysed. The subject of the study concerned artworks on flat surface and three dimensional models of a tree formed by children aged 3 to 6 years. Distinguished characteristic features of the drawn and spatially modelled "tree" may become helpful for teachers in assessing development of children. Achieved results of the research and their interpretation allowed to formulate some conclusions.

Results of research

One of the research problems referred to the structure of the trunk of "a tree". Analysis of the research material, which was constituted by models of the tree made of plasticine (Table 1) allow to conclude that in the group of three-year-olds the majority of children create chaotic figures (by layered or dispersed sticking bigger pieces on the surface), and one out of four rolled the trunk in the form of a cylinder (Table 9, model 5), but in the older groups (4-6-year-olds) almost all examined children presented it as a cylinder.

Table 1 ***Structure of the trunk of "a tree" in spatial works of children at the age of 3 to 6 years***

Tree – structure of the trunk	**3-year-olds** (n=95)	**4-year-olds** (n=74)	**5-year-olds** (n=67)	**6-year-olds** (n=96)
Trunk from balls	9,5%	0,0%	1,5%	0,0%
Trunk – cylinder	23,2%	90,5%	97,0%	95,8%
Irregular trunk	0,0%	0,0%	0,0%	1,0%
Trunk – clearly wider at the bottom	0,0%	0,0%	1,5%	3,1%
Chaotic solid figure	67,4%	9,5%	0,0%	0,0%

Source: own research

Also in the picture of the trunk (Table 2) there is a similar relation, as in the case of modelling, concerning presentation of the trunk by three-year-old children. Most of them create drawings that are illegible presentations (scribbling stage) and around every third child presents it as a rectangle (Table 10, model B, E). Such presentation is dominant in works of older children. It should be stressed that with age the examined children differentiate the shape of the trunk, emphasizing its shape, which is clearly wider at the bottom (Table 10, model C, D). In every fifth drawing of six-year-old children such a way of presenting the trunk was noticeable.

Table 2 ***Shape of the trunk of „a tree" in drawings of children at the age from 3 to 6 years***

Tree – shape of the trunk	**3-year-olds** (n=64)	**4-year-olds** (n=84)	**5-year-olds** (n=102)	**6-year-olds** (n=114)
Trunk – vertical line	0,0%	7,1%	2,0%	0,0%
Trunk – rectangle	37,5%	81,0%	82,4%	80,7%
Trunk – rectangle wider at the bottom	0,0%	4,8%	15,6%	19,3%
Scribbling stage	62,5%	7,1%	0,0%	0,0%

Source: own research

Quantitative analysis comprised also appearance of the crowns of the plasticine trees (Table 3). Most of three-year-old children created illegible forms and the models their presented usually had the crown in the form of a ball. Beside such a model, which dominated also in other age groups (Table 9, model 4), a quite frequent presentation was a horizontal shape of a circle placed on the trunk (Table 9, model 2). Other presentations appearing in groups of 5-6-year-olds was a model described as irregular (Table 9, model 6). More mature presentations of trees with wide-spreading crowns occurred in approximately every sixth sculpture created by a child from oldest age group (Table 9, model 7).

Table 3 ***Structure of the crown of "a tree" in spatial works of children at the age of 3 to 6 years***

Tree - structure of the crown	**3-year-olds** (n=95)	**4-year-olds** (n=74)	**5-year-olds** (n=67)	**6-year-olds** (n=96)
Chaotic solid figure (model 1)	67,4%	9,5%	3,0%	0,0%
Vertical circle – a lollipop type (model 3)	3,2%	5,4%	6,0%	5,2%
Ball (model 4)	14,7%	43,2%	52,2%	47,9%
Horizontal circle – mushroom type (model 2)	5,3%	28,4%	17,9%	18,8%
Irregular (model 6)	3,2%	2,7%	10,4%	10,4%
Wide-spreading (model 7)	6,3%	10,8%	9,0%	16,7%
Other (e.g. model 5)	0,0%	0,0%	1,5%	1,0%

Source: own research

In drawings of three-year-olds (Table 10), besides majority of illegible representations, among recognizable pictures of a tree we can distinguish irregular crown (Table 10, model C) and crown which is a circle (Table 10, model B). These two presentations are most frequent in drawings of older children (approximately every third child), however in the case of six-year-olds the frequency of presenting crown with irregular shape significantly increases (around half of the presentations). Models with wide-spreading crowns (Table 10, model E & F) are rarely found (Table 4).

Table 4 ***Shape of the crown of „a tree" in drawings of children at the age from 3 to 6 years***

Tree - shape of the crown	**3-year-olds** (n=64)	**4-year-olds** (n=84)	**5-year-olds** (n=102)	**6-year-olds** (n=114)
Scribbling stage (model A)	62,5%	2,4%	0,0	0,0%
Circle (model B)	12,5%	35,7%	33,3%	24,6%
Irregular (model C)	18,8%	33,3%	33,3%	47,4%
Boughs and branches in a circle (model D)	0,0%	11,9%	13,7%	10,5%
Wide-spreading (model E, F)	6,3%	16,7%	15,7%	17,5%
Other: no crown	0,0%	0,0%	3,9%	0,0%

Source: own research

Details defining the appearance of the modelled tree are not found majority of the presentations (Table 5). Even though with age their number increases, the fruits added in sculptures of 6-year-olds do not occur more often than in one out of five presentation. Children little less often shape boughs from plasticine. Other elements occur sporadically, such as: leaves, needles, roots, hollows, birds.

Table 5 ***Details occurring in "a tree" modelled by children at the age of 3 to 6 years***

Tree - details	**3-year-olds** (n=95)	**4-year-olds** (n=74)	**5-year-olds** (n=67)	**6-year-olds** (n=96)
Boughs	9,5%	16,2%	9,0%	16,7%
Leaves	0,0%	8,1%	6,0%	9,4%
Needles	0,0%	0,0%	1,5%	0,0%
Fruits	3,2%	8,1%	16,4%	19,8%
Roots	0,0%	0,0%	0,0%	3,1%
Hollow	0,0%	0,0%	0,0%	2,1%
Bird	0,0%	0,0%	1,5%	2,1%

Source: own research

In graphical records children placed details that characterized the trees little more often than in the case of the modelled sculptures (Table 6). They were most often boughs (approximately every fifth drawing), little less often fruits. With age they occur more and more often because at the age of 6 years every fifth child draws hollows. Similarly as in the case of spatial solutions, some other elements occur sporadically in graphical presentations such as: leaves, birds and roots.

Table 6 ***Details occurring in "a tree" drawn by children at the age of 3 to 6 years***

Tree - details	**3-year-olds** (n=64)	**4-year-olds** (n=84)	**5-year-olds** (n=102)	**6-year-olds** (n=114)
Boughs, branches	6,3%	28,6%	29,4%	28,0%
Leaves	6,3%	9,5%	9,8%	5,3%
Fruits	0,0%	4,8%	25,5%	24,6%
Roots	0,0%	0,0%	5,9%	3,5%
Hollow	0,0%	2,4%	11,8%	22,8%
Bird	0,0%	0,0%	2,0%	0,0%

Source: own research

It is assumed that both the technique as well as acquired experience within the scope of drawing were reasons of the fact that details characterizing the tree that occurred more frequently in drawings than in spatial models.

Table 7 ***Colours of "a tree" in spatial works of children at the age of 3 to 6 years***

Colours of the trees	**3-year-olds** (n=95)	**4-year-olds** (n=74)	**5-year-olds** (n=67)	**6-year-olds** (n=96)
Abstractive	22,1%	31,1%	17,9%	1,0%
Realistic	8,4%	54,1%	79,1%	94,8%
Partially realistic	2,1%	5,4%	3,0%	4,2%
Chaotic solid figure	67,4%	9,5%	0,0%	0,0%

Source: own research

Table 8 ***Colours of "a tree" drawn by children at the age of 3 to 6 years***

Colours of the trees	**3-year-olds** (n=64)	**4-year-olds** (n=84)	**5-year-olds** (n=102)	**6-year-olds** (n=114)
Abstractive	6,3%	0,0%	0,0%	0,0%
Realistic	31,3%	88,1%	84,3%	98,2%
Partially realistic	0,0%	9,5%	15,7%	1,8%
Scribbling stage	62,5%	2,4%	0,0%	0,0%

Source: own research

Next problem concerned the colours used by children in their works (Table 7 & 8). As far as in the case of "a tree", which was modelled, only small percentage of three-year-olds used realistic colours, in the case of drawn pictures around every third child displayed such an ability. As far as the next year of children is concerned, almost half of them modelled sculptures of trees in realistic colours and above 30 % more could draw them with the use of appropriate colours. Vast majority of five- and six-year-old children used colours relevant to reality both in the technique of modelling soft material as well as during drawing the trees.

Colours incoherent with natural "trees" were not present in any picture of children above third year of age (Table 8). They occurred more often in the sculptures they created as it was visible in works of around every third four-year-old and every sixth five-year-old. (Table 7).

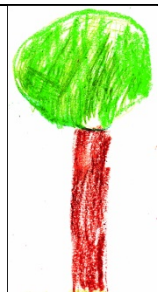
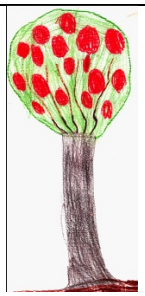
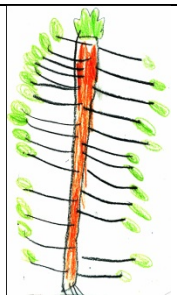
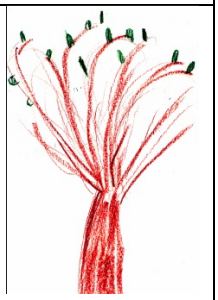
Analysis of the research material allowed to distinguish seven characteristic ways of shaping a tree (Piwowarska, 2018; Piwowarska, 2015, 160-168) from plasticine by children (Table 9). The first is constituted by chaotic pieces of plasticine stuck in layers or in a dispersed way (Table 9, model 1) – stage of creating chaotic solid figures. Its equivalent in drawings is the scribbling stage (Table 10, model 1). The following are clear shapes of a tree with differentiated crowns: from a rectangle placed on the trunk horizontally or vertically (Table 9, model 2 & 3) – stage of spatial manipulation with planes, to complete, more complex forms. They include a tree with crown in the form of a ball or a ball with added boughs (Table 9, model 4 & 5) – stage of schematization of solid figures, and trees with irregular or wide-spreading crown (Table 9, model 6 & 7), which can be classified as the stage of mature solid figures. Equivalents for trees in the shape of a ball are circles in drawings (Table 10, model B & D), whereas wide-spreading trees, having boughs and branches (Table 9, model 7 and T 10, model F)), which are a forecast of realism of the forms shaped by children, occur both in flat technique (drawing) and spatial technique (moulding).

Table 9 ***Spatial models of "a tree" shaped by children at the age of 3 to 6 years***

Stage of creation of non-representing, chaotic solid figures	Stage of spatial manipulation with planes		Stage of solid figures schematization		Stage of mature solid figures	
Chaotic solid figure	Crown - horizontal circle	Crown – vertical circle	Crown - ball	Crown - ball with boughs	Crown - irregular	Crown - wide-spreading
						
Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7

Source: own research

Table 10 ***Drawing models of "trees" presented by children at the age of 3 to 6 years***

Scribbling stage	Simplified scheme	Enriched schema			Sensation realism
No crown	Crown - circle	Irregular crown	Crown circle with boughs	Dismembered tree	
					
Model A	Model B	Model C	Model D	Model E	Model F

Source: own research

To sum up, I quote the speech by Anna Trojanowska, who noticed similarities between children's drawings and spatial forms created by them. She wrote that in modelled *solid figures made of clay or plastcine – some analogical forms occurred: equivalent of a circle is a ball, straight line – cylinder, triangle – cone etc.* (Trojanowaka, 1988, 62)

Conclusions

Analysis of the art works of children at preschool age allow to conclude that:

- The dominant model of sculptures created by this group is a tree with circular crown placed on a cylinder,
- The dominant models of pictures are trees with circular or irregular crown, placed on a rectangle,
- When presenting "a tree", younger children use more often realistic colours in drawing techniques than during shaping plasticine figures,
- Spatial models created by children revealed the stage of spatial manipulation with planes, which is impossible to be observed in drawings.

Distinguished characteristic features of the drawn and spatially modelled "tree" may become helpful for teachers in assessing development of children.

References

Buck, J. N. (1948). The H-T-P Technique, a Qualitative and Quantitative Scoring Manual. *Journal of Clinical Psychology*, (4), 317.

Fleck-Bangert, R. (2002). *O czym mówią rysunki dzieci*, Kielce: Wydawnictwo Jedność.

Hornowski, B. (1982). *Badania nad rozwojem psychicznym dzieci i młodzieży na podstawie rysunku postaci ludzkiej*. Wrocław: Wydawnictwo Ossolineum

Lovenfeld, V., & Brittain, W. L. (1977). *Twórczość a rozwój umysłowy dziecka*. Warszawa: Wydawnictwo Naukowe PWN

Parnowska-Kwiatowska, M. (1960). *Badanie twórczości plastycznej dzieci 3-4-letnich (na zajęciach zespołowych w przedszkolu.* Warszawa: Państwowe Wydawnictwo Naukowe

Piwowarska, E. (2018). *Modelowanie form przestrzennych przez dzieci w wieku przedszkolnym i wczesnoszkolnym*, Częstochowa: Wydawnictwo Uniwersytetu im. Jana Długosza.

Piwowarska, E. (2015). Kształtowanie przez dzieci form przestrzennych-doniesienie z badań. *Problemy Wczesnej Edukacji / Issues in Early Education*, (4), 160-168.

Rembowski, J. (1975). *Metoda projekcyjna dzieci i młodzieży*. Warszawa: Państwowe Wydawnictwo Naukowe.

Stora, R. (1948). L'arbre de Koch. *Enfance*, (4), 327-344.

Szuścik, U. (2006). *Znak werbalny i znak plastyczny w twórczości rysunkowej dzieci*, Katowice: Wydawnictwo Uniwersytetu Śląskiego.

Trojanowska, A. (1988). *Dziecko i plastyka*, Warszawa: Wydawnictwa Szkolne i Pedagogiczne.

Wallon, P., Cambier, A., & Engelhart, D. (1993). *Rysunek dziecka*. Warszawa: Wydawnictwa Szkolne i Pedagogiczne.